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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/722,583	11/28/2000	Jun Sik Lee	0465-0758P	5244

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EXAMINER

KEBEDE, BROOK

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 01/31/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/722,583

Applicant(s)

LEE, JUN SIK

Examiner

Brook Kebede

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 November 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- ☐ Interview Summary (PTO-413) Paper No(s). _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Claim 1 recites the limitation "depositing a conductive layer on a substrate" in line 2. However, the substrate not shown in Figs. 2A-3E. Furthermore, the conductive layer (i.e. 106 or 106a) was not deposited on the substrate. As Figs. 2C-2E, show, the conductive layer formed on the barrier film (15) wherein the region of the insulating film (101) and the plug (102). Therefore, the "substrate" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claims 7 and 8 are objected to because of the following informalities:

Claim 7 recites the limitation "the insulating film pattern" on line 1. As suggestion change "the insulating film pattern" to --the insulating film patterns-- in order to maintain proper antecedent base and in order to be consistent thorough out the claim language.

Claim 8 recites the limitation "the insulating film pattern" on line 1. As suggestion change "the insulating film pattern" to --the insulating film patterns-- in order to maintain proper

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antecedent base and in order to be consistent thorough out the claim language. Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art (1A-1E) in view of Kadomura (US/5,230,772).

Re claim 1, Applicant's admitted prior art essentially discloses a method for fabricating a capacitor of a semiconductor device comprising: depositing a conductive layer (16) on a barrier layer (15); forming a photoresist pattern (17) on the conductive layer (16); etching the conductive layer (16) using the photoresist pattern (17) as a mask to form a lower electrode (16a); removing the photoresist pattern (17) using an etchant; and forming a dielectric film (18) and an upper electrode (19) on a surface of the lower electrode (16a) (see Admitted prior art Figs. 1A-1E).

However, Applicant's admitted prior art does not specifically disclose the use of non-reactive etching gas with respect to the lower electrode during removing of the photoresist pattern.

Kadomura disclose the dry etching method for suppressing the micro-loading effects at the time of etching of the resist material by suing a known etching gas such as NH_3 to remove photoresist layer (see abstract). As Kadomura suggests, as result of suppression of the micro-

loading effect excess etching to the substrate was avoided (see Kadomura, abstract and Col. 2, lines 51-68 through Col. 3, lines 1-24)

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to have provided applicant's admitted prior art with an etchant such as ammonia as taught by Kadomura because an over-etching would have been avoided during etching of the resist layer.

Re claim 2, as applied to claim 1 above, both Applicant's admitted prior art and Kadomura in combination disclose all the claimed limitations including the limitation wherein the upper and lower electrodes are one of Ru, RuO₂, and a metal material alloyed with Ru (see Applicant's admitted prior art Fig 1C).

Re claim 3, as applied to claim 1 above, both Applicant's admitted prior art and Kadomura in combination disclose all the claimed limitations including the limitation wherein the etching gas is one of H₂O, NH₃, and N₂; a mixture of H₂, and O₂ in which an amount of H₂ is smaller than an amount of O₂, a mixture of H₂O, NH₃, and N₂, a mixture of N₂ and NH₃ a mixture of NH₃, and H₂O, or a mixture of N₂ and H₂O is used as the etching gas (see Kadomura, abstract).

Re claim 4, Applicant's admitted prior art discloses a method for fabricating a capacitor of a semiconductor device comprising: forming a conductive region (not shown) on a semiconductor substrate (not shown); forming an interleaving insulating film (11) having a contact hole (not labeled) therein over the conductive region (not shown); forming a contact plug (12) within the contact hole (not labeled); forming insulating film patterns (13 14) on of the interleaving insulating film (11) to expose the contact plug (12) and the interleaving insulating

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film (11) adjacent to the contact plug (12); depositing a barrier film (15) and a first conductive layer (16) on the contact plug (12) and the insulating film patterns (13 14); forming a photoresist (17) over the contact plug (12) between the insulating film patterns (13 14); sequentially removing the first conductive layer (16) and the barrier layer (15) on the insulating film patterns (13 14) using the photoresist (17) as a mask, thereby forming a lower electrode (16a) and a barrier film (15) in a U-shape in cross-section; removing the photoresist (17) using an etching gas; removing the insulating film patterns (13 14); and sequentially forming a dielectric film (18) and an upper electrode (19) on the lower electrode (16a) and the barrier film (15) (see Admitted prior art Figs. 1A-1E).

However, Applicant's admitted prior art does not specifically disclose the use of non-reactive etching gas with respect to the lower electrode during removing of the photoresist pattern.

Kadomura disclose the dry etching method for suppressing the micro-loading effects at the time of etching of the resist material by suing a known etching gas such as NH_3 to remove photoresist layer (see abstract). As Kadomura suggests, as result of suppression of the micro-loading effect excess etching to the substrate was avoided (see Kadomura, abstract and Col. 2, lines 51-68 through Col. 3, lines 1-24)

Therefore, it would have been obvious to one having ordinary skill in the art at the time of applicant(s) claimed invention was made to have provided applicant's admitted prior art with an etchant such as ammonia as taught by Kadomura because an over-etching would have been avoided during etching of the resist layer.

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Re claim 5, as applied to claim 4 above, both Applicant's admitted prior art and Kadomura in combination disclose all the claimed limitations including the limitation wherein the upper and lower electrodes are one of Ru, RuO, and a metal material alloyed with Ru (see Applicant's admitted prior art Fig 1C).

Re claim 6, as applied to claim 4 above, both Applicant's admitted prior art and Kadomura in combination disclose all the claimed limitations including the limitation wherein the etching gas is one of H₂O, NH₃, and N₂; a mixture of H₂, and O₂ in which an amount of H₂ is smaller than an amount of O₂, a mixture of H₂O, NH₃, and N₂, a mixture of N₂ and NH₃ a mixture of NH₃, and H₂O, or a mixture of N₂ and H₂O is used as the etching gas (see Kadomura, abstract).

Re claim 7, as applied to claim 4 above, both Applicant's admitted prior art and Kadomura in combination disclose all the claimed limitations including the limitation wherein the insulating film pattern comprises an oxide film (see Fig. 1B)

Re claim 8, as applied to claim 4 above, both Applicant's admitted prior art and Kadomura in combination disclose all the claimed limitations including the limitation wherein the insulating film pattern is formed by stacking two insulating films (see Fig. 1B).

Re claim 9, as applied to claim 8 above, both Applicant's admitted prior art and Kadomura in combination disclose all the claimed limitations including the limitation wherein the two insulating films are a nitride film and an oxide film (see Fig. 1B).

Re claim 10, as applied to claim 4 above, both Applicant's admitted prior art and Kadomura in combination disclose all the claimed limitations including the limitation wherein the barrier film is only formed on the contact plug within the contact hole (see Fig. 1C).

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure Hwang et al. (US/5,174,856), Latchford et al. (US/5,200,031), Ye et al. (US/6,331,380) and Miyama et al. (US/6,127,712) also disclose similar etching process of the resist layer.

Correspondence

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brook Kebede whose telephone number is (703) 306-4511. The examiner can normally be reached on 8-5 Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Brook Kebede
BK
January 18, 2002


Trung Dang
Primary Examiner